

Remarks

The various rejections set forth in the Office Action are discussed below under corresponding or appropriate headings.

Initial Comments

At the outset, it is noted the last Office Action is the ninth Office Action issued by the Examiner. In addition, the last Office Action is the third Office Action that has been issued since an agreement was reached during an interview conducted on March 11, 2005. Notwithstanding, the Examiner continues to maintain rejections which were thought to have been resolved during the interview.

It is noted, however, that the Examiner has offered further explanation of a rejection, and this has prompted the herein proposed amendment to claim 68. As indicated below, this amendment was not previously submitted because the language originally agreed to by the Examiner was been maintained. Therefore, the entry of the proposed amendment is believed to be proper even though the last Office Action was made final.

Rejection of Claims based on Masaaki

Claims 59-65, 67, 72 and 73 stand finally rejected as being anticipated by Masaaki (JP 62-005643). The rejection is premised on the conclusion that Masaaki discloses air gaps that are of uniform width. Although the drawings appear to show air gaps of uniform width, Masaaki has not been found to contain any disclosure as to how this might be accomplished. As is well settled, a patent claim cannot be anticipated by a prior art reference if the allegedly anticipatory disclosures cited as prior art are not enabled. Consequently, the rejection is improper and should be withdrawn.

The undersigned has been provided with the following explanation of a typical example of the invention disclosed in Masaaki:

Examples

Below, we explain the detail of typical example on this invention refer to Figure 1. Figure 1 is a diagram of cross section in case that this invention is applied to a conventional example, showing in Figure 3. In Figure 1,

there are air gaps, 6 and 7, between wires, 3, 4 and 5. Typically, SiO_2 is used as dielectric materials 2. In case that there are air gaps between adjacent two wires, we can regard the capacity between two wires as a series connection of the capacity of between one wire and air gap, air gap itself and between air gap and another wire. As the dielectric constant of dielectric material, which is air, in air gaps is about one forth of SiO_2 , which is a dielectric material used in another portion, the capacity between wires can be reduced with make air gaps like this invention. For example, the capacity of adjacent wires with air gap which size is 1/3 of length of adjacent wires is a half of no air gap. Larger the size of air gap is, smaller the capacity of adjacent wires. And, as the capacity between wire and substrate is almost all constant and independent to air gap, the portion of the capacity between adjacent wires to total wire capacity becomes smaller compared with conventional case. Consequently, a deviation of voltage to be induced by the mutual capacity of adjacent wires is reduced and it makes operation errors less and operation margin larger compared with conventional case.

It is easy to make air gap in the dielectric material 2, between adjacent wires. In the case that the mutual capacity of adjacent wires, in other words, that adjacent wires are close together and wires are thicker, the air gap is easily construct with CVD techniques after constructing wires. But, in this case, the bottom of air gap is above level the bottom of wires. To construct air gaps the bottom level of which is under the bottom of wires like Figure 1, you may etch away a certain amount of dielectric materials, 2, between wires which are 3, 4 and 5, and then deposit dielectric materials with CVD.

One thing that is evident is that CVD techniques are used to apply the SiO_2 layer 2 in which the air gaps are formed. CVD, however, typically gives rise to teardrop shape air gaps as shown in Machida, Gaw et al. (US 6,303,464), Fulford, Jr. et al. (US 6,376,330), Fulford, Jr. et al. (US 5,759,913) and Avanzino et al. (5,776,834). Thus, it is not seen how a CVD process can form air gaps as shown in the drawings of Masaaki. In the absence of a teaching as to how such air gaps can be formed following the teachings of Masaaki, Masaaki can not be relied upon as an anticipatory reference. Therefore, the rejection should be withdrawn.

In response to the foregoing comments, the Examiner contends that the illustrated shape of the air gaps in Masaaki is enabled "because patents are presumed valid pursuant to 35 U.S.C. 282 and enablement is a function of a (sic) patentability". This is wrong for two reasons.

First, 35 U.S.C. 282 has nothing to do with a Japanese patent document, such as Masaaki. 35 U.S.C. 282, as well as 35 U.S.C. 112 which sets forth an enablement requirement, are concerned with U.S. patents.

Second, 35 U.S.C. 112 requires the subject matter of the claims to be enabled. As the Examiner will readily appreciate, unclaimed subject matter will not be reviewed for enablement. Accordingly, no presumption of enablement can attach to subject matter that is not being claimed. Consequently, the shape of the air gaps would have to be claimed or otherwise enablement of such shape would never have been considered during the examination process. Again, the assumes that the reference is a U.S. patent, which it is not.

Rejection of Claims based on Avanzino

Claims 68-70 were rejected as being anticipated by or unpatentable over Avanzino. In his response to arguments, the Examiner clarified the basis for his rejection and the Examiner's position is now understood. In view of such clarification, set forth above is a proposed amendment to claim 68 which addresses the point raised by the Examiner. Entry of the proposed amendment is respectfully requested. The reason the amendment was not submitted earlier was that prior to the Examiner's clarification, the language originally agreed to by the Examiner had been maintained.

Upon entry of the amendment to claim 68, the rejection of claim 68, and the claims which depend therefrom, should be withdrawn.

Claims 66 and 74

Claims 66 and 74 were rejected as being unpatentable over Masaaki. The above comments concerning Masaaki regarding enablement are equally if not more applicable to this rejection, and therefore this rejection should be withdrawn. That is, it is not seen how the CVD process of Masaaki can obtain the features of claims 66 and 74.

Claims 71 and 74

Claims 71 and 74 were rejected as being unpatentable over Avanzino. For at least the same reasons given above in respect of claim 68, the rejection of claim 71 should be withdrawn.

Regarding claim 74, the skilled person will appreciate that the provision of air gaps having upper sides that are parallel to the planar extent of the substrate will provide performance characteristics of the semiconductor device that are different from those afforded by the air gaps taught by Avanzino. In particular, the dielectric effect of the air gap will be substantially different given the tapered top side of the air gap in Avanzino and the squared top side of the air gap illustrated in Fig. 2F. The rejection of claim 74 should therefore also be withdrawn.

Claims 68-71

Claims 68-71 were rejected as being unpatentable over Masaaki in combination with Avanzino. Avanzino does not disclose a discrete film of non-conducting material that does not extend over the conductive material nor beyond the air gap. Likewise, Masaaki does not disclose a discrete film of non-conducting material that does not extend over the conductive material nor beyond the air gap. The rejection, therefore, should be withdrawn for at least these reasons.

Request for Interview

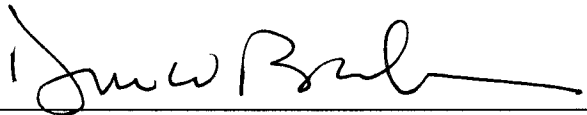
If the Examiner intends to maintain the rejections, the Examiner is requested to phone the undersigned to schedule an interview with the Examiner and also the Examiner's SPE. As above-noted, nine Office Actions already have been issued in this application. This piecemeal and lengthy prosecution of the application needs to be expeditiously brought to a close.

Conclusion

This application is believed to be in condition for allowance and an early issuance of a notice of allowance is earnestly solicited.

Respectfully submitted,

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